



Air born diseases

DISEASE

An illness or condition that prevents the body from functioning normally

COMMUNICABLE DISEASE

A disease that can be spread from one person (or animal) to another, such as a cold, strep throat, or the flu.

NON-COMMUNICABLE DISEASE

A disease that can NOT be spread from one person (or animal) to another, such as allergies, diabetes, or heart disease. You may even be born with it.



What are some disease causing agents?

Bacteria – Living microscopic organisms that may cause disease.

Virus – Microscopic organisms that cause disease. (Not living organisms.)

Fungi – Organisms that get their nutrients from other living or dead things.

Protozoa – Single celled microscopic organisms.

How are diseases transmitted?

Through the air



By touch



On food



In body fluids



Airborne Diseases

1. Acute Respiratory Tract Infections (ARI)

2. Streptococcal Diseases

3. TB

4. Smallpox

Acute Respiratory Infections(ARI)

ARI are classified depending they affect the upper or lower respiratory tract.

Factors Necessary to Establish ARI

Before a respiratory disease can be established at least four conditions need to be met:

1. There must be a sufficient “dose” of infectious agent inhaled.
2. The infectious particles must be airborne.
3. The infectious microorganisms must remain alive and viable while in the air.
4. The microorganisms must be deposited on susceptible tissues in the host.

Transmission of Respiratory pathogens

Most respiratory pathogens are transmitted by a combination of:

1. Direct contact (touch)
2. Short range (large droplet, within 1m)
3. Long range (small droplet nuclei, beyond 1 m and further)

There are several infectious disease agents that are known to spread by all three routes with equal importance. Examples: TB, measles and chicken pox.

Influenza

This is similar to a cold, but is about thirty times worse!

Causative agent: Three types of influenza virus (A, B and C)

We will discuss:

1. Seasonal Influenza
2. Avian Influenza
3. Swine Influenza

How influenza spread: Respiratory droplets (Coughing, Sneezing, Droplets on objects)

Symptoms : Cough and congestion, Fever, Headache, Body Aches, General malaise, Sore throat

Seasonal Influenza

Mode of transmission: 1. Direct droplet
2. Indirect droplet (contaminated articles with nasopharyngeal discharges).
3. Air borne infection (droplet nuclei), the virus can survive for hours.

Reservoir: man, aquatic birds and swine

Clinical picture: catarrhal manifestation, sore throat and coughing. Recovery occurs within 7 days.

Complications: are usually due to 2ry bacterial infection: bronchitis, gastroenteritis and otitis media. Myocarditis.

Dignosis:

1. Clinical
2. Isolation of virus from nasopharyngeal secretion and identification of viral antigen by ELISA.

Prevention:

- Vaccination: The vaccine needs to be upgraded annually to match the current seasonal strains.

- a. **Inactivated vaccine (flu shot):** containing A, B and current seasonal strains.

Gives in single dose for those with previous history of exposure or give in two doses, 4 weeks apart, annually before the season of influenza is expected.

Who should get a flu shot? >50 years old, Diabetic, Live or work in a nursing home,

Compromised immune system, Chronic heart, lung, or kidney disease

Will be more than 3 months pregnant during flu season

- b. **LAV:** •

Given to the healthy of age category 2-49 years. Nasal drops.

- Disinfect surfaces regularly

- Keep yourself healthy during the flu season! **Get enough rest, Eat well**

Treatment

antiviral drugs : Oseltamivir (Tamiflu oral capsules),
Zanamivir (powder inhaled by mouth)

Avian Influenza “Avian Flu”

Causative agent: Influenza virus that can infect birds and humans, Type A influenza

3 Type A viruses and each have 9 subtypes

H5: can be high or low pathogenic; can cause severe illness or death

H7: can be high or low pathogenic; infections are rare and symptoms are mild

H9: low pathogenic; very rare in humans

 **Reservoir:** Poultry, domestic birds, pigs.

Mode of transmission:

-In-between Poultry population: Droplet infection.

-From poultry to humans: by direct droplet infection as a result of direct contact with infected poultry.

Clinical picture:

Initial symptoms include high fever, influenza-like symptoms together with diarrhea, vomiting, abdominal and chest pain and bleeding from nose and gums.

Prevention:

Sanitary measures in dealing with poultry:

1. At home, percaution during defeathering and processing of poultry and appropriate cooking.
2. Personal protective measures.
3. Restrict access to birds and make a barrier area if possible.

- . Donnot keep birds inside houses.
- . Bird farms should be sheilded to protect poultry population from wild birds.
- . Poultry industry: Strict sanitary precautions for workers. These include wearing protective clothes, masks and gloves

Specific prevention

- For Paultry Population- Vaccination by LAV vaccine.
- For Humans:- Antiviral

Swine Influenza

Causative agent: The swine influenza virus (H1N1)

Measles

Causative agent: Measles virus

Reservoir: Man

Mode of infection: 1. Direct droplet infection.

2. Indirect droplet through contaminated article.

Immunity :- Maternally acquired in 1st 6-12 months

- Solid by: 1. Natural infection 2- Active immunization

Clinical Picture: Catarrhal Stage: running nose, sneezing, coughing and lacrimation Exanthematous stage:

Rash, it It starts as small red spots

Prevention: active immunization: LAV of measles, revaccinate at 18 months

Control: Early case finding: Isolation, Disinfection, Treatment

Mumps

- **Causative agent:** Mumps virus
- **Reservoir:** man
- **Mode of transmission:** -Direct droplet
 - Indirect (contaminated articles by saliva)
- . **Clinical Picture:** fever, headache, then followed by swelling and tenderness of one or more salivary glands
- . **Prevention:** active and passive immunization
 - MMR vaccine (LAV of measles, mumps and rubella given at 18 month)

Control: cases same

Diphtheria

Definition: Acute bacterial toxic disease of tonsils, pharynx, larynx, nose, conjunctiva and skin

Causative agent: *Corynebacterium diphtheriae* (gram positive bacilli), The virulent strains produce powerful exotoxins

- **Reservoir:** Man
- **Mode of infection:** -Direct droplet -Indirect
 - Raw milk (unpasteurized)

Immunity: 1. Maternally acquired usually lasts 6 months

-2. Disease usually induces life-long immunity.

-3. Antitoxin immunity effectively protects against systemic diseases

Susceptibility is diagnosed by Schick test through ID injection of diluted diphtheria toxin to illustrate presence of antitoxic Ab. +ve skin reaction indicates susceptibility while absence of skin reaction denotes negativity

Clinical picture: Dead tissue cells, WBC and RBC and bacterial cells form a dull gray exudate referred to as a pseudomembrane can block airway in trachea – suffocation- Tracheotomy may be required

Thick mucopurulent (mucous and pus) nasal discharge
Fever, Cough, sore throat, Malaise (vague feeling of physical discomfort), Enlarged and tender cervical lymph nodes

Prevention: Immunization: (active and passive)

Active immunization: Toxoid made from diphtheria toxin part of DPT vaccine (Diphtheria, Pertussis, Tetanus)

Administered at 2, 4, 6, and 15-18 months, and again at 4-6 years with boosters every 10 years recommended (especially if traveling to areas where diphtheria is endemic – Asia, Africa, Central and South America and Russia)

Passive immunization (Seroprophylaxis): diphtheria antitoxins.

Chemoprophylaxis: Penicillin I M Erythromycin

Diagnosis

1. Laboratory culture – swab the tonsillar area, added to medium (chocolate or blood agar)

Enriches for *C. diphtheriae* and restricts growth of normal flora of the throat: Tellurite is reduced to tellurium metal precipitate (dark gray to black colonies)

2. Detection of toxin

In vitro virulence test = ELEK test

Streak bacteria out on agar in lines

Lay a paper strip containing anti-toxin antitoxin antibodies

Include a positive control in parallel to patient's sample

Incubate and look for line of identity (precipitate caused by immune complexes)

Susceptibility test

SCHICK Test (rarely used anymore)

Diphtheria toxoid inject subcutaneously

Wait 48 hours and note formation of induration in the absence of antibodies = susceptible → immunity not present

If antibodies are present (immune) then toxin is neutralized → no induration

Treatment

Antitoxin administered to neutralize the toxin

Immediate administration based on symptoms rather than waiting for laboratory results

Also administer penicillin or erythromycin

Pertussis (Whooping cough)

Definition: Acute highly infectious bacterial disease of the respiratory tract.

Causative agent: Bordetella pertussis (**Small, Gram negative cocco-bacillus**)

Pathogenicity: is due to adhesives (allow adherence of organisms to ciliated epithelium of resp. tract). Toxins; exotoxin.

Reservoir: man

Mode of infection: Direct droplet from patient to others, contaminated articles and fomites.

Clinical picture: The disease progresses in stages

Catarrhal stage: Inflamed mucous membranes

Resembles a cold (sneezing, coughing), Follows infection of ciliated epithelium of RTI lasts 7-10 days

Spasmodic/Paroxysmal stage

After 1-2 weeks

Prolonged coughing with inspiratory whoop

Exhaustive

Vomiting

Convulsions

Lasts ~2 weeks

Convalescent stage

Lasts a further 2 weeks or sometimes longer

Immunity: 1. Maternally acquired
2. One attack gives prolonged imm.

Diagnosis:

-Culture

Push swab in back of nose to posterior nares and ask patient to cough

Swab (not cotton) coated with penicillin

Cultured on Bordet-Gengou medium

Potato blood glycerol agar (high % blood, 20-30%)

3-4 days

-Detection

Agglutination tests

Fluorescent antibodies

-Prevention :

Immunization (active and passive).

Active immunization: either pertussis vaccine alone or as part of DPT.

DPT (TRIPLE VACCINE): it is killed pertussis vaccine, toxoids of diphtheria and tetanus.

Treatment: Antibiotics

Erythromycin or tetracyclines or chloramphenicol

Not always helpful, but important in limiting secondary infections (bronchitis and pneumonia caused by other organisms).

Streptococcal Diseases caused by Group A beta Hemolytic Streptococci

1. Streptococcal pharyngitis/tonsillitis (sore throat)

Causative agent: Streptococcus pyogenes.

Reservoir: Man

Modes of transmission:

- Direct droplet infection
- Indirect infection from soiled articles.
- Milk which may be contaminated from droplets of food handlers or infected udder of the animal.
- **Clinical picture :** sudden onset of fever, exudative tonsillitis or pharyngitis and tender.

Scarlet fever

Clinical picture: fever, rash (is caused by erythrogenic exotoxin :pyrogenic exotoxin A,B and C), strawberry tongue.

Immunity: 1. Antibacterial immunity
2. Antitoxic immunity.

Deck test: is a skin test where diluted toxins are injected ID. However, negative test indicates immunity.

Treatment and Prevention:

Penicillin and for individuals allergic to penicillinG, erythromycin or azithromycin may be used.

Tuberculosis

Disease caused by bacteria called *Mycobacterium tuberculosis*
Chronic bacterial infection

Mode of transmission: 1. Aerolized droplet nuclei that are produced by persons with pulmonary or high respiratory tract TB during coughing, sneezing.
2. Bovine TB results from exposure to tuberculous cattle occurs through:
- Ingestion of unpasteurized contaminated milk or dairy products.

Airborne spread from cattle to farmers and animal handlers.-

Reservoir: 1. Humans-

2. Animals (diseased cattle)-

Clinical Picture: Night fever, night sweats, anorexia, weight loss - and anemia.

Pulmonary manifestations including productive cough, - dyspnea, pain on the affected site.

- Diagnosis:** 1. Morning sputum examination for isolation and culture of the organisms.
2. X- ray of the lung to show suspected shadow.
3. Tuberculin skin testing (TST) and interferon-gamma release assays (IGRA). These tests become positive after 2-6 weeks.
4. PCR for rapid sure diagnosis

Prevention and Control:

Preventive measures:

1. Diagnosis and Treatment
2. Educate the public regarding mode of spread, methods of control and importance of early diagnosis.
3. Reduce or eliminate social conditions that increase the risk of infection and progression to disease (malnutrition, occupational silicosis, indoor air pollution, smoking and alcohol abuse.)

Control of patient, contacts and the immediate environment

Vaccination: BCG vaccine is given by single ID injection in the left arm

Small pox

Contagious infectious disease

Causative agent: Variola virus

Reservoir: Man

Mode of transmission: 1. Direct droplet

2. Indirect droplet

3. Prolonged contact with infected person

Contact with infected body fluids or contaminated objects

Clinical picture: Severe, Very high fever

Large rash

Prevention:

By vaccination: vaccine is prepared from live vaccinia virus (cowpox virus)

